CLAIMS

1. Apparatus for producing a marking (45) for example digits, letters, surface patterns, surface images or decoration, on a substrate (43), preferably a film, in particular a transfer film, comprising

a replication apparatus (41) having a replication surface, and

a device for producing radiation, preferably a laser installation (30), which co-operates with the replication apparatus (41), by the radiation being directed onto at least one irradiation region (44) of the replication apparatus for producing at least one shaping region, and

a counterpressure apparatus (42),

wherein a substrate (43) is arranged between the replication apparatus (41) and the counterpressure apparatus (42) in order to shape the shaping region onto the substrate (43) into a contact region between the replication apparatus (41) and the substrate (43),

characterized in that

the feed of the radiation for producing the shaping regions extends outside the substrate (43).

2. Apparatus as set forth in claim 1 characterized in that the Poynting vector of the radiation upon impingement on the replication apparatus (41) does not point onto the contact region and/or that the Poynting vector of the radiation upon impingement onto the replication apparatus (41) points onto the contact region but the radiation does not reach the substrate (43) in the contact region.

3. Apparatus as set forth in one of claims 1 and 2 characterized in that there is provided an additional energy source which is preferably separate from the radiation-producing device.

4. Apparatus as set forth in claim 3 characterized in that the additional energy source is such that the temperature of the replication

apparatus (41) is adjustable at least in partial regions of the replication surface by means of the additional energy source.

5. Apparatus as set forth in one of claims 3 and 4 characterized in that the additional energy source is formed by a heating laser device and/or an inductive heating device and/or a resistance heating device and/or a device for producing heat beams.

6. Apparatus as set forth in one of the preceding claims characterized in that the replication apparatus (41) is a stamping punch or a stamping cylinder, in particular a rotating roller.

7. Apparatus as set forth in claim 6 characterized in that the rotating roller is of a length of between 500 mm and 2,500 mm and/or its periphery is between 500 mm and 1,500 mm.

8. Apparatus as set forth in one of the preceding claims characterized in that there is provided a control device for controlling the irradiation regions, in particular a freely programmable control device, wherein it is preferably provided that the control device is adapted for actuating the radiation-producing device.

9. Apparatus as set forth in one of the preceding claims characterized in that there is provided a cooling apparatus for cooling the replication surface, in particular partial regions of the replication surface, which is preferably in the form of a blower, gas flow cooling or a cooling roller.

10. Apparatus as set forth in one of claims 3 through 9 characterized in that the additional energy source is arranged within the replication apparatus.

11. Apparatus as set forth in one of the preceding claims characterized in that the radiation is directed onto the replication surface

of the replication apparatus (41) so that it impinges on the replication surface.

12. Apparatus as set forth in one of the preceding claims characterized in that the radiation is arranged parallel to the substrate (43) and/or perpendicularly to the irradiation region of the replication apparatus (41).

13. Apparatus as set forth in one of the preceding claims characterized in that the replication apparatus (41) has an inside surface (60) which is parallel to and/or concentric with the replication surface and the radiation is directed onto the inside surface (60) so that the radiation impinges on the inside surface (60).

14. Apparatus as set forth in claim 13 characterized in that arranged between the inside surface (60) and the replication surface is or are a metal film, in particular a film of nickel or a nickel compound, and/or an absorption layer and/or a heat-conducting layer and/or a transparent layer, in particular a plate or a cylinder which are transparent in relation to the wavelength of the radiation.

15. A process for producing a marking (45) on a substrate (43), preferably a film, in particular a transfer film,

wherein energy in the form of radiation, preferably laser radiation, from a device producing radiation is used for producing at least one shaping region on a replication surface of a replication apparatus, and

wherein the shaping region of the replication surface is shaped onto the substrate (43)

by the replication apparatus (41) contacting the substrate (43) under pressure,

characterized in that

the radiation for producing the shaping regions is fed outside the substrate (43).

16. A process as set forth in claim 15 characterized in that the replication apparatus (41) is subjected to a temperature control effect at least in partial regions of the replication surface using an additional energy source which is preferably separate from the radiation-producing device.

17. A process as set forth in claim 16 characterized in that at least one heat combination region is formed on the replication surface by an energy input from the additional energy source and an energy input from the radiation-producing device.

18. A process as set forth in one of claims 16 and 17 characterized in that the shaping region is shaped, which corresponds to the heat combination region or which is complementary to the heat combination region.

19. A process as set forth in one of claims 16 through 18 characterized in that the temperature of the replication surface, which prevails during the shaping operation, is set to a plastic temperature range in at least one region outside the heat combination region by the temperature control effect operation, and that the temperature of the replication surface, which prevails during the shaping operation, is set to a flow temperature range in at least one region within the heat combination regions by the energy additionally introduced with the radiation.

20. A process as set forth in one of claims 16 through 18 characterized in that the temperature of the replication surface, which prevails during the shaping operation, is set to an elastic temperature range in at least one region outside the heat combination region by the temperature control effect operation, and that the temperature of the replication surface, which prevails during the shaping operation, is set to a plastic temperature range in the region within the heat combination regions by the energy additionally introduced with the radiation.

21. A process as set forth in one of claims 15 through 20 characterized in that a range within +/-2% of a substrate-specific plastic temperature is used as the plastic temperature range.

22. A process as set forth in one of claims 15 through 21 characterized in that the range of 180°C +/- 2.5°C is used as the plastic temperature range.

23. A process as set forth in one of claims 15 through 22 characterized in that the replication surface is subjected to a homogenous temperature control effect completely or in surface portions prior to the energy input from the radiation-producing device.

24. A process as set forth in one of claims 15 through 23 characterized in that the temperature of the replication surface is set to at least 100°C, preferably at least 170°C.

25. A process as set forth in one of claims 15 through 24 characterized in that the temperature control of the replication surface is effected by electrical heating and/or by pre-heating radiation, in particular a pre-heating laser beam.

26. A process as set forth in one of claims 15 through 25 characterized in that the replication surface is cooled completely in partial regions after the shaping operation and/or prior to a following energy input from the radiation-producing device.

27. A process as set forth in one of claims 15 through 26 characterized in that the radiation is directed onto the replication surface of the replication apparatus and/or that the radiation is introduced onto a surface remote from the replication surface.

28. A process as set forth in one of claims 15 through 27 characterized in that the radiation is introduced into the replication

apparatus before and/or while the heat combination region resulting therefrom is in contact with the substrate.

29. A process as set forth in one of claims 15 through 28 characterized in that a replication roller is used as replication apparatus and that the introduction of radiation into the replication roller is effected at a first angular position of the replication roller and the contact of the replication roller with the substrate is effected at a second angular position of the replication roller, wherein an intermediate angle which is different from 0°, preferably less than 180°, in particular less than 90°, is set between the first angular position and the second angular position in the direction of rotation of the replication roller.

30. A process as set forth in one of claims 15 through 29 characterized in that the radiation acts on the replication apparatus over an area and/or in point form sequentially.

31. A process as set forth in one of claims 15 through 30 characterized in that the position of the impingement point of the radiation on the replication surface is controllable by a one-dimensional or multi-dimensional movement of the radiation and/or that the power density in relation to surface area of the radiation at the impingement point of the radiation on the replication surface is controllable.

32. A process as set forth in one of claims 15 through 31 characterized in that the radiation-producing device has a plurality of laser sources which are preferably spaced from each other and which in particular are in the form of a diode laser array and in particular are individually actuatable.

33. A process as set forth in claim 31 or 32 characterized in that a control sequence for actuation of the radiation-producing device extends over more than one operating cycle of the replication apparatus, for

example a revolution of the replication roller or a stroke of the stamping punch.

34. A process as set forth in one of claims 15 through 33 characterized in that the energy input from the radiation-producing device is introduced in the heat combination region by direct absorption and/or heat conduction.

35. A process as set forth in one of claims 15 through 34 characterized in that an apparatus as set forth in claim 1 through 14 is used.